Land Information System

A primary function of the American Samoa Coastal Zone Management Program (ASCMP) is to administer and maintain a land-use permitting system for the territory. Developing a suitable and effective land information system has been complicated by the notion of communal lands prevalent in Samoan society. Resistance of the local population to methods for land parcel tracking traditionally used in the mainland United States (e.g. land surveys for the determination of parcel borders, deeds of ownership, etc.) requires the development of an innovative approach to create a properly functioning land-use permit system.

Presently, the Permit Renewal and Notification System (PNRS) is operated by staff of ASCMP and contains a database of land-use activities spanning a period of 18 years. However, database structure has not remained consistent over this time period and is lacking a spatial component. Furthermore, the complexity involving the issue of communal lands has resulted in no clearly defined system of parcel identification. The assistant will accomplish the tasks listed below in order to create a functional land information system based upon a cohesive and comprehensive database. Ultimately, the assistant will integrate GIS into the land-use permit system and provide staff with training to incorporate said technology into the routine land-use permit application process.

<u>Outline of tasks:</u>

1. Investigate all PNRS land-use databases
2. Familiarize with MS Access and customization with Visual Basic
3. Investigate third party solutions (including software options)
4. Clean-up databases and create workable primary key
5. Develop system to identify parcels and track land use
6. Create system for integration of GIS with land-use permitting system
7. Add mapping capabilities to workstations of ASCMP staff
8. Provide staff with training for use of GIS software.

GIS Infrastructure: Organizational System And Metadata Requirements

GIS data has been collected by numerous agencies and organizations for a time spanning decades in American Samoa. Data accumulation has often occurred without inter-agency coordination and almost always without attention given to metadata. In addition, GIS data has been collected in a number of datums and/or coordinate systems that have been either isolated from one another or geo-spatially flawed. Consequently, the present state of GIS data is one of overall confusion due to disorganization, mismatched and erroneous data layers, no knowledge of data background, and little or no associated attribute data.

In order to address this problem the GIS assistant has been assigned the task of completing a data inventory, creating a system to properly catalogue and organize existing data layers and providing metadata to the extent possible for all GIS data in the territory. Furthermore, the GIS assistant will identify and isolate erroneous data and search for solutions to correct this data. Also included in this task is the determination of appropriate datums and coordinate systems to be used in the territory and organization of the data in such a way as to easily differentiate between datums and coordinate systems. Upon completion of assigned tasks, the GIS assistant will promote the new organizational scheme, metadata standards and techniques for datum/coordinate system conversions throughout the territory. The following is a list of stated tasks for the development of a solid GIS data infrastructure.

<u>Outline of Tasks:</u>

1. Inventory existing GIS data.
2. Identify and isolate erroneous data.
3. Resolve problems with erroneous data.
4. Determine standardized datums and coordinate systems to be used.
5. Develop mechanisms and manual for datum/coordinate system conversions.
6. Create a user-friendly directory system.
7. Catalog all files with FGDC quality metadata.
8. Promote standards of GIS organization, datum/coordinate system conversions, and metadata development throughout territory.

Build Local GIS Capacity – Counterpart Training

Efficient operation of government agencies in American Samoa is compromised due to a lack of technical expertise in the field of GIS. The utility of GIS in government operations ranging from land-use permitting to highway construction is widely recognized. In spite of high demand for such qualified personal supply remains quite limited. Small territorial population size, limited opportunities for advanced education and comparatively low salaries all contribute to the scarcity of local expertise. The assistant in his/her role as a technical expert in GIS can address this problem by building local capacity.

By providing the necessary training the assistant will succeed in developing technical expertise and thus, independence within the staff at the Department of Commerce. Within the Coastal Zone Management Program at the Department of Commerce there are staff members who possess GIS skills ranging from beginning to intermediate. The assistant will work with these individuals to enhance their knowledge of GIS and improve their abilities to utilize this technology. Furthermore, the assistant will identify other ASCMP staff members that could benefit from the use of GIS and develop a program to provide training. However, the utility of GIS is not limited to the ASCMP division and therefore, promoting the use of GIS will extend into other divisions such as Business and Statistics.

The assistant can further promote the use of GIS and build capacity in the territory through involvement with the GIS program at American Samoa Community College (ASCC). Recognizing the critical need for GIS technology in American Samoa, the Institute of Technology at ASCC developed a program to educate students in the use of GIS. It is expected that the assistant will interact with staff at ASCC, provide technical input when necessary and occasionally provide classroom instruction as a guest lecturer.

<u>Outline of tasks:</u>

1. Provide advanced training to ASCMP staff with GIS experience.
2. Identify ASCMP staff that can benefit from GIS and teach basics.
3. Promote use of GIS in other Divisions of DOC.
4. Provide technical input to staff at ASCC.
5. Provide occasional classroom instruction at ASCC as guest lecturer.

Base-map Layer Updates – IKONOS Satellite Imagery

Extensive development of the landscape occurring as a result of population pressure exposes the urgent need for updated base-map layers for roads and buildings on Tutuila. The population of American Samoa has experienced tremendous growth during the last 40 years, increasing from ~16,000 in 1960 to ~57,000 in 2000 (U.S. Census Bureau). The majority of growth is concentrated on the island of Tutuila where 96% of the population resides. Land resource availability on this volcanically formed island with average slopes exceeding 20% is increasingly limited as only 30 % of the 52 square mile island (i.e. ~16 sq. miles) is suitable for development. In particular, the Tafuna Plain in Tualauta County, is undergoing a large transition from small isolated communal villages to an expansive developed area of contiguous residential areas and industrial parks. Updated base-map layers for roads, buildings and land use will provide the means to conduct analyses of change over time, examine developmental trends and patterns, determine limitations to development, and aid in government planning efforts.

High-resolution IKONOS satellite imagery will be used to develop updated base-map layers for the Territory of American Samoa. Upon obtaining the imagery from Space Imaging Inc., the assistant will help collect ground control points to be used in geo-rectification. Thereafter, the assistant will work together with other staff in the GIS section of ASCMP to 1) form an organizational plan to complete tasks in a timely manner, 2) develop a standard operating procedure to accomplish tasks in a consistent manner, and 3) create a system of quality control to ensure the utility and reliability of the final product. In addition, the assistant will be assigned the task of teaching the process of base-map layer creation to local counterpart(s) and other involved staff.

<u>Outline of tasks:</u>

1. Collect ground control points for geo-rectification of imagery.
2. Create organizational plan to complete base-map layer updates.
3. Develop a standard operating procedure for creating updated base-map layers.
4. Create a system of quality control
5. Teach counterpart(s) and staff in base-map layer creation.

Water Resource Management: Wetlands, Streams, and Watersheds

Water resource management is of paramount importance in a land surrounded by ocean water and saturated by nearly constant rain events that continually replenish hundreds of streams and wetlands. Numerous agencies manage and support operations to protect oceanic resources (ASG Department of Marine Wildlife Resources, USDA National Resource Conservation Service, US National Park Service, ASG Environmental Protection Agency) while few target inland aquatic systems. ASCMP at the Department of Commerce has been involved with wetland conservation efforts for a number of years. Staff members have worked with villages to develop historical wetland boundary maps and to delineate and map present-day wetland boundaries for conservation of these dwindling, precious natural resources. Streams on Tutuila have received considerably less attention than wetlands. Both the National Park Service (NPS) and American Samoa Environmental Protection Agency (ASEPA) are considering initiatives for monitoring water quality of fresh-water lotic systems, but to date only the Land Grant Program at the American Samoa Community College is actively involved in the streams. The Research Division of the Land Grant College has undertaken a project to develop bio-criteria standards for stream ecosystems on the island of Tutuila.

The assistant will become involved in projects involving both wetland and stream ecosystems. Delineation of wetland boundaries will be completed during the next two years and GIS support for future wetlands projects in ASCMP will be provided. Due to the assistant's interest and expertise in stream ecosystems, it is expected that a plan will be formulated to improve existing GIS stream data and develop projects to monitor the streams of Tutuila. Available GIS data for stream networks on the island lack attribute data, thus requiring updates to add information such as names, unique identification numbers, stream orders and historical biological data. In order to establish a stream monitoring program the assistant will investigate the level of interest in other agencies and coordinate with interested parties to develop a congruent monitoring plan. All field data collected in monitoring projects will be used to update GIS stream maps.

On the watershed scale, ASEPA has been actively engaged in developing programs. Consultants were hired by ASEPA in the early 1990s to produce a GIS map

layer delineating watershed boundaries. The Malaeimi Valley has become the focal point of ASEPA efforts at watershed protection as it has been determined to be the principle source of groundwater recharge to the aquifer that supplies drinking water to island residents. Mapping efforts underway to delineate a special management area will require support from the GIS section at the Department of Commerce. The assistant will aid in survey efforts by applying expertise in the collection of GPS data. He will also help ASEPA review agreements with third party contractors to ensure that collected data is accurate, usable, and that proper metadata is supplied.

ASEPA has also begun a program of monitoring several water chemistry parameters at numerous sites along the shorelines of American Samoa. The assistant will aid in this effort by collecting GPS data at the sampling site locations. Furthermore, the assistant will provide limited training to select ASEPA staff in the use of GIS software.

Outline of tasks:

1. Complete wetlands delineation project.
2. Provide support to ASCMP wetlands specialist.
3. Update GIS data for streams.
4. Investigate stream monitoring efforts on island.
5. Develop stream water chemistry and biological monitoring plan.
6. Assist in survey efforts for Malaeimi Valley Special Management Area.
7. Review third-party agreements for GIS data collection.
8. Collect GPS data for shoreline sampling sites.
9. Train ASEPA staff in basics of GIS.

Website For GIS Section – Publicly Available GIS Data

Widespread use of the internet as an information highway stresses the need for a website that provides information about the GIS efforts by ASCMP as well as contact information for the GIS staff. The assistant's experience in website design will be utilized to create a GIS webpage linking to the main page of the American Samoa Government Department of Commerce (www.amsamoa.com). A description of GIS activity at the Department of Commerce will be provided as well as email addresses for GIS staff.

By making GIS data publicly available over the internet, the GIS staff will spend less time fielding data requests and spend more time producing data and conducting spatial analyses. The assistant will devise a system to make GIS data available over the internet. He will also take measures to ensure that data provided is of the highest possible quality and that it includes metadata.

Outline of tasks:

1. Create webpage for GIS section linked to mainpage of DOC.
2. Provide contact information on webpage.
3. Make GIS data publicly available over the internet.

GIS User's Group Participation – Spatial Data Infrastructure

A dramatic increase in island-wide GIS activity during the last decade has resulted in the creation of a GIS user's group, an organization that serves to unify and strengthen GIS efforts in the Territory. It is extremely important that GIS staff members at the Department of Commerce are involved in this group and that they spearhead efforts to promote and improve the use of GIS in American Samoa. The assistant will be expected to attend all user's group meetings, organize and facilitate meetings on a revolving basis, and occasionally arrange for or provide presentations and training sessions.

The GIS user's group is in the process of developing a territory-wide spatial data infrastructure that is fully supported by the GIS staff at ASCMP. The GIS section is committed to the formation of the spatial data infrastructure and will provide the greatest support possible in composing suitable documents and conducting meetings with appropriate government entities to institute territory wide standards. The assistant will provide help whenever possible to establish a spatial data infrastructure in American Samoa.

Outline of tasks:

1. Participate in user's group meetings.
2. Organize and facilitate meetings on a revolving basis.
3. Arrange for or provide presentations and training sessions.
4. Assist in development of a territory-wide spatial data infrastructure.